Made in the United States of America
Reprinted from TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY
Vol. 90, No. 1, January, 1961
pp. 13–20

Atlantic Coast Migration of Large Striped Bass as Evidenced by Fisheries and Tagging

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ABSTRACT

During studies of Atlantic coast striped bass, *Roccus saxatilis* (Walbaum), by the U. S. Fish and Wildlife Service and co-operators from 1955 to 1959, 478 large fish ranging in weight from 6 to 54 pounds and in age from 3 to 18 years were tagged. Tagging locations were the North Carolina coast, where 81 fish were tagged; Albemarle Sound and Roanoke River, North Carolina, where 97 fish were tagged; and Chesapeake Bay and tributaries, where 300 tags were applied. Catches by commercial and sport fisheries indicated that large striped bass concentrated on the coast of North Carolina in late fall and winter, on or near spawning areas for striped bass in North Carolina and Chesapeake Bay in late winter and spring, and along the coast north of Chesapeake Bay as far as Massachusetts in the summer and fall. Recaptures were made of 19 fish tagged on the North Carolina coast; 23 tagged in Albemarle Sound and the Roanoke River, North Carolina; 27 tagged in Chesapeake Bay and its tributaries; and 1 tagged in the Thames River, Connecticut. Some fish were recaptured near the tagging location but most of them migrated along the coast and were caught in other concentration areas during the season of greatest fishing pressure.

INTRODUCTION

In 1955 the U. S. Fish and Wildlife Service began a study which was concerned primarily with the effect of pollution, dams, and fishing pressure upon population size and spawning potential of striped bass, *Roccus saxatilis* (Walbaum). Investigations were first centered in North Carolina and then extended to Chesapeake Bay in 1957 in co-operation with the States of Maryland and Virginia (Sykes, 1958).

One phase of the research was designed to determine the extent of movement of large striped bass prior to and following their appearance among populations of smaller fish of the same species in sound and bay systems along the Atlantic coast. Fish 6 pounds in weight and heavier were considered large. These usually occur in small numbers in commercial catches and display migratory habits which have not been adequately delineated.

Tagging of some large individuals was reported by Merriman (1941); Vladykov and Wallace (1952); and Raney, Woolcott, and Mehring (1954). These studies resulted either in no recaptures or in recovery of the tagged fish near the site of release after a short period of time. Migration studies of large striped bass in Oregon (Morgan and Gerlach, 1950) and in California (Calhoun, 1952) show pre- and post-spawning movements within the rivers and bays, but no oceanic migration is indicated.

The present report describes migratory habits of large striped bass as determined by recent tagging programs and examination of fisheries in North Carolina, Chesapeake Bay and its tributaries, and in Connecticut. The North Carolina coastal fishery is unique in that it is entirely dependent upon the capture of large striped bass which are concentrated by area and by season each year when virtually no other species are landed. This fishery is therefore treated in greater detail than those in other areas.

FISHERIES CATCHING LARGE STRIPED BASS

North Carolina

The only known commercial fishery now being operated exclusively for catching large striped bass on the entire Atlantic coast is a haul-seine fishery in North Carolina. It is centered on the outer banks between Kitty Hawk and Cape Hatteras, a distance of approximately 50 miles, and is active during the late fall and winter months. Fish landed by the seines are known in this area as "jumbo rock." The seines currently being used vary in dimension, but generally are 5 to 7 yards deep and 425 yards long. Size of mesh (stretched) varies from 6 to 8 inches at the end of the seine and 2 to 3 inches in the center.

The first known reference to the striped bass fishery on the outer banks was by Worth (1889). He reported a single catch made by haul seine in 1887 consisting of 4,000 pounds of striped bass ranging in weight from 5 to 60 pounds. Although catch records are not available for the years prior to 1956, this reference and recent interviews with fishermen of the

TABLE 1.—*Monthly catches (pounds) of large striped bass landed on the North Carolina coast and in Albemarle Sound for seasons 1956–57 through 1958–59*[1]

Month	Season					
	1956–57		1957–58		1958–59	
	Albemarle Sound	North Carolina coast	Albemarle Sound	North Carolina coast	Albemarle Sound	North Carolina coast
September	56	–	–	–	–	–
October	13	–	–	–	–	1,000
November	22	23,000	9	–	9	3,000
December	17	111,000	16	5,000	221	51,000
January	250	14,000	227	10,000	360	20,000
February	155	6,000	145	14,000	30	60,000
March	61	3,000	149	–	114	15,000
April	114	–	–	–	190	–
Total pounds	688	157,000	546	29,000	924	150,000

[1]Unpublished catch data, U. S. Bureau of Commercial Fisheries, Biological Laboratory, Beaufort, North Carolina. Coastal catches were reported by fishermen to the nearest thousand pounds.

area indicate that this fishery has probably operated since 1887.

Catch records of the North Carolina coastal fishery were obtained for the fishing seasons 1956–57, 1957–58, and 1958–59. Of the three seasons, the first and third produced approximately equal catches of striped bass, while the 1957–58 production was comparatively low (Table 1). Wind and high seas limited passage of fishing boats through the surf during most of this season. A minimum of five and a maximum of ten seines were known to operate during the 3 years of observation, and the period of fishing extended from late November until early March.

In addition to the coastal landings, large striped bass are taken in small quantity in the fisheries of Albemarle Sound and the Roanoke River, North Carolina. Goode (1903) stated that numerous catches were made in the western end of Albemarle Sound in 1844. He further reported that in 1876 one seine haul took 820 striped bass weighing 37,000 pounds. Of this catch, 365 fish averaged 65 pounds per fish, and a few individuals weighed 90 pounds. Smith (1907) reported that large individuals were caught in the eastern end of the sound in 1891. Presumably small striped bass were also caught during these hauls, since a resident population of fish which are predominantly small presently inhabits the sound.

Examination of commercial striped bass catches in Albemarle Sound in the years 1956 through 1958 has shown that few large fish are caught there now. The few that were taken (Table 1) were caught by anchor gill nets, haul seines, pound nets, and purse nets. These types of gear are fished for small striped bass and American shad (*Alosa sapidissima*) and are distributed throughout the sound. Catches on the coast and in Albemarle Sound are landed in approximately the same season. Oregon Inlet, a cut in the outer banks between the Atlantic Ocean and Albemarle Sound, provides a passageway through which fish may move between the two fishing grounds.

The Roanoke River, a tributary of Albemarle Sound, is the principal striped bass spawning area in North Carolina. Worth (1884, 1910) stated that many large fish were caught and stripped of ova in that river during early attempts at artificial propagation, but few are now taken in the spawning run (Dickson, 1958). There is no other known area in North Carolina where many of them are found in the spawning run, so no shift from one location to another is in evidence. Several striped bass weighing from 20 to 40 pounds have been reported in the Roanoke River in recent years, but a majority of them have weighed less than 6 pounds. Sykes and Lewis showed that spawning in the Roanoke River occurs primarily in late April and in May.[1]

Chesapeake Bay

It was not possible to separate catches of large fish from the total striped bass catch in Chesapeake Bay because there is no separate large-fish fishery, and fish sizes in commercial catches were not obtained during this study. Some large fish were known to be present, however, particularly in spring during the spawning season. Spawning in Chesapeake Bay tributaries occurs from April through

[1] Sykes, James E., and Robert M. Lewis. Manuscript. Striped bass spawning populations in relation to changing environmental factors in Roanoke River, North Carolina.

TABLE 2.—*Weight (pounds) and length (inches) of 265 large striped bass from North Carolina coast, Albemarle Sound, and the Roanoke River, and 303 large striped bass from Chesapeake Bay and the Potomac River*

Location and year	Number of fish	Weight		Fork length	
		Range	Mean	Range	Mean
North Carolina					
1955					
Coast	81	21.0–52.0	37.0	31.0–47.5	41.8
Albemarle Sound	3	6.0– 8.5	6.8	21.9–25.8	23.9
1956					
Coast	22	*6.0–40.0	*27.0	21.5–45.0	37.4
Albemarle Sound	4	6.5– 7.9	7.4	23.3–24.9	24.1
Roanoke River	27	6.0–18.5	8.9	21.5–32.0	24.9
1957					
Coast	2	**	**	41.0–45.0	43.0
Albemarle Sound	6	6.1–12.5	8.6	22.7–28.1	25.0
Roanoke River	19	6.0–14.2	8.4	20.4–29.2	24.0
1958					
Coast	63	12.2–50.0	32.4	30.8–48.8	39.9
Albemarle Sound	21	6.2–16.2	8.4	20.2–31.6	24.6
Roanoke River	17	6.2–10.0	7.4	20.3–24.6	22.6
Chesapeake Bay area					
1957					
Chesapeake Bay	112	6.0–44.0	12.6	21.0–44.0	29.6
1958					
Chesapeake Bay	9	7.0–51.6	26.6	25.0–46.6	35.3
1959					
Chesapeake Bay	28	†	†	21.0–50.0	30.2
Potomac River	154	6.0–57.0	16.2	21.7–46.6	30.1

*Estimated
**No range; each of two fish estimated at 35 pounds
†Only one fish weighed (16.5 pounds)

June (Massmann *et al.*;[2] Pearson, 1938; Tresselt, 1952). Recent studies have indicated that most spawning in the Potomac River in 1959 was completed by May 15.

North of Chesapeake Bay

Commercial striped bass fishing is illegal in all states north of Chesapeake Bay with the exception of Delaware, New York, and Rhode Island. There are sport fisheries in several states, and the principal areas where the large striped bass are caught are on the ocean shores of the states. The most productive areas on the basis of hook-and-line catches are: Barnegat Bay and Sandy Hook, New Jersey; Montauk Point, New York; Block Island, Narragansett, Watch Hill, and Newport, Rhode Island; and Cuttyhunk, Nantucket, and Cape Cod, Massachusetts (Fitzpatrick and Cookson;[3] Lyman and Woolner, 1954). In some of these states sport catches can be marketed. Casting and trolling are both practiced in the coastal sport fishery, which is usually active from early July through late October.

[2] Massmann, William H., Ernest C. Ladd, and Henry N. McCutcheon. (1952) A biological survey of the Rappahannock River, Virginia, Part 1. Virginia Fish. Lab., Gloucester Point, 112 pp. (Mimeo.)

[3] Summaries of reports on striped bass investigations for 1956 and 1957. Commonwealth of Massachusetts, Dingell-Johnson Proj. F4R. (Mimeo.)

MATERIALS AND METHODS

Four types of tags were used to mark the fish in this study. Petersen disk tags with nickel pins were used on the fish tagged on the North Carolina coast. Petersen disk, nylon streamer, and soft and hard spaghetti tags were used in Albemarle Sound and in the Roanoke River (Davis, 1959). In the Chesapeake Bay area, Petersen disk, nylon streamer, and jaw ring tags were used. The jaw ring, or split ring and plate tag, was designed and described by Vladykov (1956). A return address and serial number were printed on each tag, and a reward was paid for the tag return.

Scales were collected and fork length and weight were recorded from portions of commercial landings and from most of the fish which were tagged. Weights of some fish tagged on the North Carolina coast in 1956 and 1957 were estimated. To check the accuracy of the estimates, they were plotted on the empirical length-weight curve of North Carolina fish from which complete data were obtained. Comparison showed estimated weights to be within the observed ranges for fish of similar lengths.

Large fish on North Carolina beaches were immobilized for marking by having one operator hold the tail down while another straddled the head region and faced the tail

TABLE 3.—*Age of 414 large striped bass from commercial catches in North Carolina and the Potomac River*

Age group	North Carolina coast				Albemarle Sound				Roanoke River			Potomac River	Total
	1955	1956	1957	1958	1955	1956	1957	1958	1956	1957	1958	1959	
III	—	—	—	—	1	—	—	1	1	2	1	18	24
IV	—	1	—	—	1	—	1	4	2	6	8	25	48
V	—	—	—	2	—	2	1	5	13	4	4	14	45
VI	—	2	—	2	1	—	3	7	7	2	4	25	53
VII	1	2	—	13	—	—	—	2	—	—	—	28	46
VIII	3	4	—	6	—	1	1	—	2	2	—	22	41
IX	4	2	—	6	—	—	—	—	1	—	—	10	23
X	3	1	—	6	—	—	—	—	—	—	—	6	16
XI	5	4	—	4	—	—	—	—	—	—	—	3	16
XII	3	2	1	8	—	—	—	—	—	—	—	3	17
XIII	11	—	1	5	—	—	—	—	—	—	—	1	18
XIV	14	2	—	6	—	—	—	—	—	—	—	5	27
XV	16	1	—	3	—	—	—	—	—	—	—	2	22
XVI	7	—	—	2	—	—	—	—	—	—	—	2	11
XVII	5	—	—	—	—	—	—	—	—	—	—	—	5
XVIII	1	—	—	—	—	—	—	—	—	—	—	1	2
Number	73	21	2	63	3	3	6	19	26	16	17	165	414
Average age	13.4	9.6	12.5	10.2	4.3	6.0	5.8	5.3	5.5	4.9	4.6	6.8	8.3

to attach the tag. Scales were taken and length was measured while the fish was lying on the beach. For determination of weight, the fish was pushed head first into a large plastic bucket which was then suspended from scales mounted on a tripod. Immediately after weighing, the fish was carried in the bucket to the water.

In Chesapeake Bay and tributaries fish were tagged and scales, length, and weight obtained as they were taken from nets into commercial fishing boats. Tagging was done in the manner previously described, but was slightly more difficult because deck space was limited.

Twenty-two large striped bass were tagged in the vicinity of Oregon Inlet, North Carolina, in December 1956, and 57 were tagged there in December 1958. Because fishing success was relatively poor there in the 1957–58 season, few fish were observed and only two were tagged.

From 1955 through 1958, 4,361 striped bass of all sizes were tagged from commercial fishing gear in Albemarle Sound, North Carolina. Of these, 34 fish were in the large category and were tagged from late October through March. From 1956 through 1958, 856 fish of all sizes including 63 large fish were tagged from commercial gear in the Roanoke River, North Carolina. The period of tagging extended from April through early July.

During the cooperative study between the States of Maryland and Virginia, and the U. S. Bureau of Commercial Fisheries, 7,254 fish were tagged in Chesapeake Bay and tributaries from 1957 through 1959, and of these 149 were large fish. Areas of tagging in Virginia were the York, James, and Rappahannock Rivers; and in Maryland, the Nanticoke and Elk Rivers, the Chesapeake and Delaware Canal, and Spesutie Island, Swan Point Bar and in the vicinity of the Little Choptank River.[4] In addition to this tagging in the Chesapeake Bay system, 2,197 striped bass of all sizes taken by commercial gear were tagged in the Potomac River from January to May, 1959. Of these, 92 were large fish.

In the spring and summer of 1956, 131 striped bass of all sizes were tagged in the Thames River, Connecticut, by the Connecticut State Board of Fisheries and Game. Weights at the time of tagging are unknown except for one large fish.

In addition to those fish tagged, large striped bass landed by beach seines and other commercial fishing gear were occasionally examined. In December 1955 and December 1958, a total of 87 large striped bass was examined on the North Carolina coast and length, weight, and scales were obtained for the purpose of supplementing data from tagged fish. In 1959, 62 large fish were examined from catches in the Potomac River.

Ages were determined from plastic impressions of scales which were removed from the left side of the body midway between the two dorsal fins and the lateral line. Usually 8 to

[4] Information regarding these fish and some tagged in the Chesapeake Bay area in 1955 and 1956 prior to the co-operative study was supplied through the courtesy of Maryland Department of Research and Education, Maryland Department of Tidewater Fisheries, D-J Project F3R—Rockfish Investigations, and Virginia Fisheries Laboratory.

TABLE 4.—*Summary of 19 striped bass tagged in 1956 and 1958 on the North Carolina coast and recaptured*

Date of tagging	Number tagged	Location of recovery							
		Near tagging site		Albemarle Sound[1]		Chesapeake Bay[1]		On coast north of bay[2]	
		Number	Weight	Number	Weight	Number	Weight	Number	Weight
December 3–19, 1956	22	—	—	2	25.0[3] 6.0	2	40.0[3] 30.0[3]	2	25.0[3] 10.0[3]
December 2–23, 1958	57	5	29.2 19.5 17.8 17.8 17.2	—	—	6	49.5 34.2 32.8 30.2 29.1 18.2	2	33.0 27.2
Total	79	5	—	2	—	8	—	4	—

[1]Prior to and during spawning
[2]After spawning
[3]Estimated weight

12 scales were obtained from each fish. The scale impressions were viewed with an Eberbach scale projector and a dissecting microscope, and age assigned from the number of completed annuli. Two biologists read the scales independently and in cases of disagreement, the scales were re-examined jointly. The first joint reading produced agreement in about two-thirds of the cases.

Ranges and means in weight and fork length were obtained from 568 large striped bass tagged and examined in North Carolina and in the Chesapeake Bay area from 1955 to 1959 (Table 2). Age frequency of 414 North Carolina and Potomac River fish is shown in Table 3.

TAG RECOVERIES

Of the 79 large fish tagged on the North Carolina coast in 1956 and 1958, recoveries were made in four separate fishing areas: five fish within 10 days after release near the point of tagging; two in Albemarle Sound prior to or during the spawning season; eight in the Chesapeake Bay system prior to and during the spawning season; and four on the Atlantic coast after the spawning season (Figure 1). One of these four fish was taken off Sandy Hook, New Jersey, on June 16; one at Elberon, New Jersey, on August 5; one off Watch Hill, Rhode Island, on July 15; and one at Provincetown, Massachusetts, on September 27 (Table 4). Neither of the two fish tagged in 1957 was recaptured.

Of the 34 large striped bass tagged in Albemarle Sound in 1955, 1956, 1957, and 1958, one was recovered at Dennis, Massachusetts, on July 8, 1956; 12 in the sound during commercial fishing seasons; and one in the Roanoke River in May (Table 5).

Of the 63 large fish tagged in the Roanoke River during the spawning runs of 1956, 1957, and 1958, one was recovered near the tagging site in the season of tagging and eight in Albemarle Sound during commercial fishing seasons of the next 2 years (Table 5).

Of the fish tagged in the Chesapeake Bay area, 14 recoveries were made from the 92 large fish tagged on and near the spawning

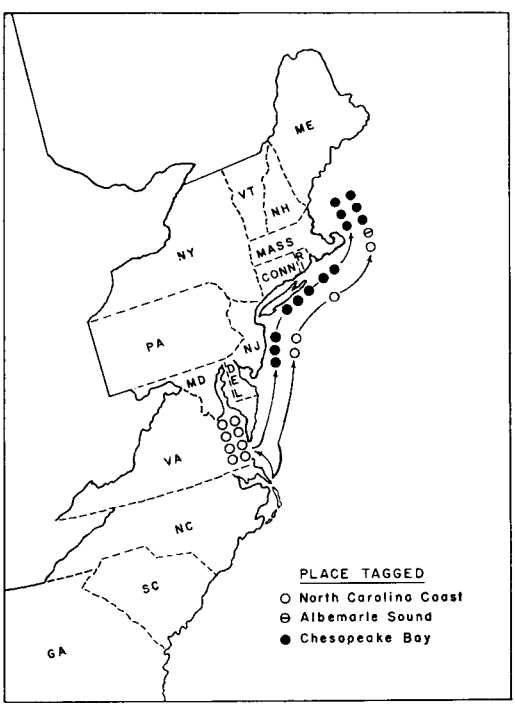

FIGURE 1.—Recovery points of fish tagged on the coast of North Carolina; in Albemarle Sound, North Carolina; and in Chesapeake Bay.

TABLE 5.—*Summary of 23 striped bass tagged in Albemarle Sound and in the Roanoke River, North Carolina, 1955–58, and recaptured*

Date and place of tagging	Number tagged	Location of recovery							
		Near tagging site		Albemarle Sound[1]		Roanoke River[1]		On coast north of bay[2]	
		Number	Weight	Number	Weight	Number	Weight	Number	Weight
Albemarle Sound									
November 22–28, 1955	3	—	—	—	—	—	—	1	8.5
November 13—December 10, 1956	4	1	6.5	—	—	1	7.6	—	—
February 25–27, 1957	5	—	—	4	9.0 7.8 7.6 6.1	—	—	—	—
October 29, 1957	1	—	—	1	8.5	—	—	—	—
January 15—March 24, 1958	21	3	10.8 7.4 6.2	3	16.2 10.1 8.2	—	—	—	—
Roanoke River									
April 19—July 2, 1956	27	—	—	6	17.0 9.0 7.0 6.3 6.2 6.0	—	—	—	—
April 1—May 14, 1957	19	1	8.3	1	6.5	—	—	—	—
April 30—May 9, 1958	17	—	—	1	6.2	—	—	—	—
Total	97	5	—	16	—	1	—	1	—

[1]Prior to or during spawning
[2]After spawning

grounds of the Potomac River in 1959 (Table 6). Four of these fish were recovered in the Potomac River and eight in Chesapeake Bay during the spring and summer of 1959. Two fish were caught on the coast north of the bay subsequent to the spawning season; one at Cuttyhunk, Massachusetts, on June 10, and the other at Montauk, New York, on October 17.

The 13 returns from fish tagged in other areas of Chesapeake Bay were made after the spawning season. Recovery of 12 of these fish was made along the Atlantic coast north of the bay (Figure 1) from June through October, and one fish was recovered south of the bay on the North Carolina coast in December. Some recoveries referred to have been listed previously by Mansueti (1958), by Hollis for the Maryland Board of Natural Resources (1955, 1956, 1957, and 1958), and by Hollis and Davis.[5] These include the recovery of fish tagged in the Nanticoke River, in the Chesapeake and Delaware Canal, and at Spesutie Island (Table 6).

One fish which was tagged in the Thames River, Connecticut, in June 1956 was recaptured in December 1959, 891 days later, on the North Carolina coast. This was the only fish recovered in North Carolina of the 131 fish tagged in Connecticut. Twenty-six recoveries were made either in the Thames River or nearby water systems in the next 3 years. An additional three fish were recovered along the Atlantic coast south of the tagging site; one off New Jersey and two in Chesapeake Bay. Weights of the recaptured fish are unknown except for the fish recovered in North Carolina.

DISCUSSION AND CONCLUSIONS

It is apparent from the present study and those made by Merriman (1941), Raney (1952), and Vladykov and Wallace (1952) that two primary size groups of striped bass exist in fisheries of the Atlantic coast; one occurring prominently in the 2- to 3-pound class. and the other in the 30- to 40-pound class. The smaller group ranges in weight from 1 to 6 pounds and the larger from 6 pounds to approximately 75 pounds. The latter group, which comprises a small portion of the total catch, represents the small percentage of fish which escape natural and fishing mortality for several years. Fishing mortality appears to be particularly high during the first 3 years of life.

The separation of the two groups is most apparent in North Carolina, where in December both a geographical and a size difference

[5] Hollis, Edgar H., and Harold A. Davis, Jr. (1955) Report of striped bass studies in Maryland. Atlantic States Marine Fish. Comm., Chesapeake Bay Sect., 14th Ann. Meeting, Virginia Beach, Va., Appendix CB. (Mimeo.)

TABLE 6.—*Summary of 27 recaptured striped bass tagged in Chesapeake Bay area*

Place of tagging	Date of tagging	Number tagged	Location of recovery: Near tagging site (within bay system) Number	Near tagging site (within bay system) Weight	On coast north of bay after spawning Number	On coast north of bay after spawning Weight	On coast south of bay after spawning Number	On coast south of bay after spawning Weight
Nanticoke River, Maryland	April 22, 1955	4	—	—	1	27.0	—	—
	May 9–10, 1956	15	—	—	1	15.0[1]	—	—
	April 19–29, 1958	2	—	—	2	48.0 16.0	—	—
	April 9, 1959	5	—	—	1	20.0[1]	—	—
Spesutie Island, Maryland	May 10, 1956	34	—	—	3	25.0[1] 24.0[1] 22.5[1]	—	—
Chesapeake and Delaware Canal, Maryland	April 26–30, 1957	16	—	—	1	6.5	1	45.0[2]
Potomac River, Maryland	January 24—May 4, 1959	92	12	17.2 16.0 15.2 15.0 14.9 14.8 13.6 13.5 12.3 12.0 11.9 8.8	2	28.5 21.5	—	—
York River, Virginia	February 27, 1957	37	—	—	2	11.2 8.6	—	—
	February 25, 1958	1	—	—	1	7.5	—	—
Total		206	12	—	14	—	1	—

[1]Weight determined at time of recovery
[2]Estimated weight at tagging

are clearly illustrated. On the Albemarle Sound side of the outer banks there is an extensive, resident population of the small size group, while on the ocean side fish in the large size group are concentrated. Most fish from the coastal catches weighed 6 pounds or more, and the population was distinct from all others on the basis of fish size and location of the group in the season of observation.

The recovery of large striped bass tagged in the North Carolina coastal fishery, which is specifically for large fish, showed that this fishery is seasonal, because large fish are present for only short periods during their extensive coastal movements. Fish tagged on the coast of North Carolina in two fishing seasons were recovered in the commercial fisheries of North Carolina or Chesapeake Bay prior to or during the spawning period or by sport fisheries on the coast north of Chesapeake Bay after the spawning season. Some of the spring recoveries were made directly on or near the spawning grounds of Chesapeake Bay and Albemarle Sound tributaries. These recoveries link the North Carolina fish with large striped bass that are taken occasionally on known spawning grounds of Chesapeake Bay and Albemarle Sound. Fish tagged in Albemarle Sound and in the Roanoke River over a 4-year period were recovered either in the commercial fisheries of the sound or river or in the sport fisheries north of Chesapeake Bay after the spawning season.

The combined tag returns from all areas show a continuation of what is believed to be a seasonal migratory cycle similar to that of the American shad (Talbot and Sykes, 1958). Tags applied to striped bass in the bay and tributaries over a 5-year period were recovered from the bay or from the Middle Atlantic and New England coasts in the summer and fall and on the coast of North Carolina in late fall and winter.

The fact that some fish tagged in the Potomac River were recovered in Chesapeake Bay as late as September shows that all of the large fish do not leave the bay immediately after the spawning season. Fish tagged in Albemarle Sound and in the Roanoke River over a 4-year period were recovered as late as October in the sound and did not all leave it immediately after the spawning season. A few large striped bass are taken at all seasons of the year in Albemarle Sound and Chesapeake Bay, but these fish appear in largest number at the times and in the places of

major tag recoveries. Movement from New England south to North Carolina needs further verification even though a complete migratory cycle is suggested.

This study of movement of large striped bass between states helps in clarifying one element of the life history of this species and presents problems differing from those encountered in management of the more restricted estuarine populations. It is apparent that the large fish are subject to exploitation in three widely separated geographical areas each year. With this knowledge available, further study of management problems will be facilitated.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the aid given by William H. Massmann of Virginia Fisheries Laboratory, Romeo J. Mansueti of the Maryland Department of Research and Education, and Edgar H. Hollis of the Maryland Department of Tidewater Fisheries, in supplying tag-return information and in critical review of the manuscript. Appreciation is also expressed to the personnel of the Connecticut State Board of Fisheries and Game for supplying tagging information.

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